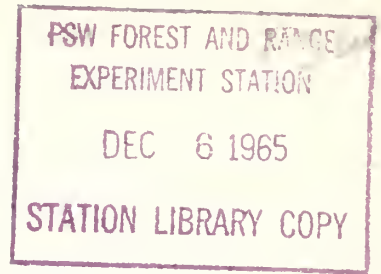


Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

1-5
U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

WASATCH NATIONAL FOREST



ALTA AVALANCHE STUDY CENTER

Miscellaneous Report No. 7

RANGE, COST AND STORAGE INFORMATION
FOR AVALAUNCHER PROJECTILES

R. M. Stillman
Avalanche Hazard Forecaster
Arapaho National Forest

September 1965

401

RANGE CARD COMPARISON BETWEEN TWO- AND THREE-POUND FINNED PROJECTILES

Most of the control firing with the avalauncher done at Berthoud Pass is accomplished by using the standard 2-pound finned projectile. At times during the winter when heavy deposition takes place it is felt that another pound of high explosive would give a more positive answer.

The range cards that have been worked up for this projectile have been used by myself and a new launcher crew with amazing accuracy. During the latter part of the winter several control missions were fired using a 3-pound charge which can be fired just as accurately and with as much reliability as a 2-pounder.

When the 3-pounder leaves the launcher muzzle visual tracking indicates that it wobbles more than the 2-pounder. However, at a distance of about 100 yards out of the muzzle the wobble disappears and flight characteristics seem to be as good as the standard charge. During high broadside wind conditions the projectile appears to fly with a slight list. The fin assembly, offering more wind surface, seems to be blown further off line of travel than the forward end of the projectile. However, the total wind drift of the 3-pound projectile appears to be less than the 2-pound projectile. These flight characteristics have been made by observation only.

Below are reproduced the two range cards which are used for control missions at Berthoud Pass.

Gun position is the same for both. Impact area is about the same for all projectiles. These data do not allow for windy conditions.

Card No. 1 - 2 lb. Standard Finned Projectile

<u>Target No.</u>	<u>Angle E</u>	<u>Pressure</u>	<u>Tubes</u>	<u>Range</u>
1	25 deg.	95	2	370
2	29	95	2	433
3	25	100	2	400
4	32	95	2	466
5	32	95	2	600
6	38	110	2	620
7	35	100	2	600
8	39	110	2	880

Card No. 2 - 3 lb. Finned Projectile

<u>Target No.</u>	<u>Angle E</u>	<u>Pressure</u>	<u>Tubes</u>	<u>Range</u>
1	30	135	2	370
2	30	135	2	433
3	30	125	2	400
4	32	140	2	466
5	32	140	2	600
6	39	140	2	620
7	37	125	2	600
8	39	145	2	880

These cards appear to indicate that if a person has good range cards for a standard 2-pound finned projectile from ranges of 370 to 900 yards and he desired to shoot 3-pound, angle E can remain the same while an increase pressure of 40 P.S.I. will be good for the first ranging shot. Indications are that it is possible to shoot 1,000 yards with a 3-pound finned projectile.

A few rounds of 4-pound projectiles have been shot at Target 8. All data remained the same as shown on Card No. 2 except the pressure. It was necessary to use $P = 170$ for this 880 yard shot.

COST DATA FOR FIN-STABILIZED PROJECTILES

During the past winter (1964-65) many people have inquired about the price of a fin stabilized projectile round which is propelled from the avalauncher. In this report no attempt has been made to figure cost data for the unstabilized HDP round because none have been fired. All firing was done with the fin stabilized projectile.

Following is a list of component parts with prices FOB Denver. This list is first presented in bulk form and then reduced to cost per unit in a following list. Items listed do not constitute an endorsement of products. Other available sources may prevail in other geographical locations.

The make-up of the projectile is what the writer used this past winter. Investigation has shown that some prices will change for next winter's operation. Also, a substitution in products has shown that a saving can be achieved. Prices for next winter's operation will be shown at the end of this writing.

Nitramon S - Primers, 2" Diameter (Used exclusively this past winter)	\$43.75/100 lbs. FOB Denver 21.88/case (50-1 lb. cans) case .44/lb. (1 can)
Fin assemblies with Pressure Plate	\$195.00/100 FOB L. A. 1.95 each
Nose cones, 2" diameter	\$16.00/100 .16 each
No. 6 Blasting Caps	\$3.30/100 .033 cents each
Safety Fuse	\$1.51/100 ft. .015 cent/ft.
Pull Wire Fuse Ignitors	\$3.00/100 .03 cents each

113 Cu. Ft. of Nitrogen	\$3.87/cylinder
(Ave. 15 shots/cylinder)	.26 cents/shot

Therefore, a breakdown per shot is as follows:

1 Fin assembly	\$1.95
2 Pounds nitramon S-Primer at .44/lb.	.88
1 No. 6 Blasting Cap	.033
1 Nose cone, 2" diameter	.16
1 12" piece of safety fuse (includes trimming to 7")	.015
1 Charge of N as propellant	.26
1 Small amount of glue	.05
	<u>\$3.348</u>
	Total per standard projectile

Investigation this spring indicates that a reduction in cost per standard 2 lb. fin stabilized projectile for next winter season 1965-66 is going to be possible.

The Diamond King Co., makers of the fin assembly, reports that fin assemblies will be reduced to under \$1.50 each. For the following cost study, assume \$1.50 as the cost of fin assembly.

Investigation with the DuPont people indicate that by using Nitramon S in the lead can a reduction of .11 cents per round is possible while still retaining the same amount of "wallop" as delivered by 2 pounds of Nitramon S-Primer.

Contemplated cost of fins for next season, 1965-66 is \$1.50 each

Nitramon S	\$32.50/100 lbs. FOB Denver
	16.25/case (50-1 lb cans case)
	.33/lb. (1 can)

Therefore, if a reduction in cost of fins and substituting Nitramon S in the lead can is used in round assembly, the cost per round should be as follows-- if all other components remain price stabilized.

1 Fin assembly	\$1.50
1 Pound Nitramon S-Primer	.44
1 Pound Nitramon S	.33
1 No. 6 Blasting Cap	.033
1 Nose cone, 2" diameter	.16
1 12" piece of safety fuse (includes trimming to 7")	.015
1 Charge of Nitrogen as propellant	.26
1 Small amount of glue	.05
Total cost per standard two-pound fin stabilized projectile for season 1965-66 should be	\$2.788

A saving of .56 cents per round.

A TEST ON LENGTH OF STORAGE FOR AVALAUNCHER - FIN ASSEMBLIES

During the winter of 1963-64 users of the avalauncher often asked how long a complete fin assembly could be stored and still remain functional. The question could not be answered because no information was available.

This winter a simple test was run in an attempt to get an answer. Test procedure was as follows:

On November 17, 1964 individual components were collected which were necessary to make up 10 complete assemblies. Fuse was cut to a length of 8 inches. All components were assembled and glued to the fin just as would be done for a firing mission. The assembled fins were dated, put in a cardboard box and put in the storage room. The storage room was a bedroom which was generally kept closed off from the main portion of the living quarters. Generally the room was kept cool but would reach 65 degrees F. when, occasionally the area was used as a workshop.

A thermometer was installed in the storage space and temperatures were recorded at intermittent intervals throughout the test program. Relative humidity was not recorded. At intervals of approximately a month some of the test fin assemblies were put into a regular firing mission group of fins. After a storm the normal number of projectiles fused for an avalanche control mission is about 10. This means that during each firing mission 8 fresh fin assemblies and 2 test assemblies were fired for a control project.

On December 17, 1964 the first test was fired. Two of the fins dated November 17 and 8 fresh assemblies were fired. In each assembly all com-

ponents were made into a complete firing unit in the same manner.

Just before firing, one inch of fuse was cut off before crimping on the cap, thus exposing a fresh powder train in the fuse. This makes final fuse firing length of 7". (See manufacturers operation manual)

On the 10th of January, four of the test assemblies were fired.

On the 20th of February two more were fired.

On the 17th of March the remaining two test assemblies were fired.

On each firing mission all test assemblies ignited and caused charge detonation.

Summary

The test, described above, indicated that the fully assembled fin component may be stored as long as four months in a cool, dry room. Temperature of the storage room varied from 32°F to 65°F. Relative humidity was not measured but probably did not go higher than 40% nor less than 10%.

